

The Prevalence of Adverse Childhood Experiences (ACEs) and their Association with Current Health, Montana Behavioral Risk Factor Surveillance System (BRFSS), 2011

INTRODUCTION

There is mounting scientific evidence that child maltreatment and household dysfunctions may be risk factors for the leading causes of illness and mortality, as well as poor quality of life in the United States.^{1,2} Original research with a large cohort of participants in the Kaiser Permanente health care system documented that a variety of Adverse Childhood Experiences (ACEs; see Sidebar) were relatively common in a predominantly white, well-educated, middle class sample.³ ACEs were associated with poor health outcomes later in life, including poor physical and mental health status and premature mortality. The Centers for Disease Control and Prevention (CDC) and ACE researchers developed a standardized ACE module for the Behavioral Risk Surveillance System (BRFSS) to determine whether ACEs were also common in representative samples of the adult population.⁴ Since 2009, the module has been administered by 17 states and Washington DC.⁵ Montana was one of the five states to administer it in 2011.

METHODS

BRFSS is a probability sample of non-institutionalized adults with landline or cell telephone service conducted by trained interviewers. Details of the BRFSS survey can be found elsewhere.⁶ The full questionnaire can be found on our website.⁷

ACE questions address childhood abuse, with three categories, and household dysfunction, with five categories (Sidebar). The childhood sexual abuse category contains three questions and the household member substance abuse category contains two questions, but each category contributes only one point to the total ACE score. Although some of the questions have graded answers (never/once/more than once), the scoring system does not measure the frequency or severity of individual ACE items. The questions are not assigned differential weights. A respondent's ACE score is the simple sum of positive answers in the eight categories.

This report presents the estimated prevalence of individual ACEs and summary ACE scores from the 2011 Montana BRFSS. We examined the relationship of ACE scores to selected health risk behaviors and health outcomes reported by the respondents. We used multiple logistic regression analysis to describe the association between ACE scores and health outcomes, controlling for the effects of age group, sex, race, and educational attainment.

Adverse Childhood Experience Module and Scoring

Child Abuse:

1. **Physical Abuse** [Once or more than once]
How often did a parent or adult in your home ever hit, beat, or physically hurt you in any way?
2. **Sexual Abuse** [Once or more than once to any question]
How often did anyone at least 5 years older than you, or an adult, ever touch you sexually?
How often did anyone at least 5 years older than you, or an adult, try to make you touch them sexually?
How often did anyone at least 5 years older than you, or an adult, force you to have sex?
3. **Verbal Abuse** [More than once]
How often did a parent or adult in your home ever swear at you, insult you, or put you down?

Family Dysfunction:

4. **Mental Illness** [Yes]
Did you live with anyone who was depressed, mentally ill or suicidal?
5. **Substance Abuse** [Yes to either question]
Did you live with anyone who was a problem drinker or alcoholic?
Did you live with anyone who used illegal street drugs or who abused prescription medications?
6. **Separation/Divorce** [Yes]
Were your parents separated or divorced?
7. **Violence between Adults** [Once or more than once]
How often did your parents or adults in your home ever slap, hit, kick, punch, or beat each other up?
8. **Incarceration** [Yes]
Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?

RESULTS

Estimated Prevalence of Individual ACEs

Among Montana adults, 60% reported experiencing at least one ACE (Figure 1). Childhood abuse alone was reported by 8.8% (CI=7.8-9.5) of adults, 21.5% (CI=20.2-22.9) reported only household dysfunctions, and 29.3% (CI=28.1-32.1) reported both. Although the distribution of total ACE scores was similar for men and women, more women than men reported experiencing sexual abuse and having lived with a household member who was mentally ill (Table 1). The percent of each ACE category except physical abuse and sexual abuse was lower among adults ages 55 years and older than among younger adults. More adults 18 to 34 years than older adults reported living with a household member who was mentally ill, having a household member in prison, and having divorced or separated parents. The prevalence of each ACE category was higher among adults with lower incomes than among those with higher incomes. The percent of each ACE category except living with a household member who was mentally ill was higher among American Indian than among White adults. The prevalence of each ACE category except living in a household with divorced or separated parents was higher among adults who reported a disability than those who did not. Wording of the disability question did not permit assessing the relationship between ACEs and disabilities that may have been present in childhood or disabilities that may have developed later in life.

Table 1. Prevalence of Individual Adverse Childhood Experience (ACE) by Selected Characteristics, BRFSS, 2011 §

| | | Experienced Verbal Abuse ¹ | | | Experienced Physical Abuse ² | | | Experienced Sexual Abuse ³ | | | Household Member Mentally Ill ⁴ | | | Household Member in Prison ⁵ | | | Household Member Abused Substances ⁶ | | | Parents Divorced/ Separated ⁷ | | | Witnessed Domestic Violence ⁸ | | |
|---------------------|-------|---------------------------------------|------|------|---|------|------|---------------------------------------|------|------|--|------|------|---|------|------|---|------|------|---|------|------|--|------|------|
| Sample | | 95% CI | | | 95% CI | | | 95% CI | | | 95% CI | | | 95% CI | | | 95% CI | | | 95% CI | | | 95% CI | | |
| | Size* | Wt. % | LL | UL | Wt. % | LL | UL | Wt. % | LL | UL | Wt. % | LL | UL | Wt. % | LL | UL | Wt. % | LL | UL | Wt. % | LL | UL | Wt. % | LL | UL |
| All Adults: | 10265 | 31.1 | 29.7 | 32.6 | 17.4 | 16.2 | 18.6 | 12.5 | 11.5 | 13.6 | 19.1 | 17.9 | 20.4 | 7.5 | 6.6 | 8.6 | 31.7 | 30.2 | 33.2 | 27.7 | 26.3 | 29.2 | 17.0 | 15.8 | 18.2 |
| Sex: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Male | 4407 | 32.3 | 30.1 | 34.5 | 17.4 | 15.7 | 19.3 | 7.8 | 6.5 | 9.3 | 16.2 | 14.5 | 18.1 | 8.4 | 6.9 | 10.0 | 31.2 | 29.1 | 33.5 | 28.6 | 26.5 | 30.9 | 16.3 | 14.6 | 18.3 |
| Female | 5858 | 30.0 | 28.1 | 32.0 | 17.4 | 15.8 | 19.1 | 17.1 | 15.6 | 18.8 | 21.9 | 20.2 | 23.8 | 6.7 | 5.6 | 8.0 | 32.1 | 30.1 | 34.1 | 26.9 | 25.0 | 28.9 | 17.6 | 15.9 | 19.3 |
| Age: | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 - 34 | 1489 | 34.9 | 31.6 | 38.4 | 18.4 | 15.8 | 21.3 | 11.3 | 9.2 | 13.8 | 27.2 | 24.2 | 30.4 | 13.8 | 11.4 | 16.6 | 33.7 | 30.4 | 37.1 | 39.4 | 36.0 | 42.9 | 17.9 | 15.2 | 21.0 |
| 35 - 54 | 2980 | 35.0 | 32.4 | 37.7 | 19.2 | 17.1 | 21.5 | 15.9 | 13.9 | 18.2 | 19.5 | 17.3 | 21.9 | 7.6 | 6.1 | 9.5 | 36.9 | 34.3 | 39.7 | 31.0 | 28.4 | 33.8 | 20.3 | 18.1 | 22.7 |
| 55 and older | 5737 | 25.1 | 23.4 | 26.9 | 15.3 | 13.9 | 16.9 | 10.5 | 9.3 | 11.7 | 13.0 | 11.6 | 14.4 | 2.8 | 2.2 | 3.6 | 25.6 | 23.9 | 27.4 | 16.2 | 14.7 | 17.8 | 13.4 | 12.1 | 14.9 |
| Education: | | | | | | | | | | | | | | | | | | | | | | | | | |
| <High School | 751 | 37.3 | 31.7 | 43.3 | 31.3 | 26.2 | 37.0 | 21.0 | 16.4 | 26.6 | 26.6 | 21.4 | 32.6 | 20.9 | 15.9 | 27.0 | 43.0 | 37.2 | 49.0 | 43.8 | 37.9 | 49.9 | 28.7 | 23.5 | 34.6 |
| High School | 3317 | 30.9 | 28.2 | 33.6 | 16.2 | 14.2 | 18.5 | 11.0 | 9.4 | 12.9 | 16.6 | 14.5 | 18.9 | 9.3 | 7.6 | 11.4 | 35.2 | 32.5 | 38.1 | 29.8 | 27.2 | 32.5 | 18.1 | 15.9 | 20.6 |
| >High School | 5420 | 30.3 | 28.5 | 32.2 | 15.9 | 14.5 | 17.3 | 11.9 | 10.7 | 13.3 | 19.3 | 17.8 | 20.9 | 4.4 | 3.6 | 5.4 | 28.0 | 26.3 | 29.8 | 24.1 | 22.4 | 26.0 | 14.5 | 13.2 | 16.0 |
| Income: | | | | | | | | | | | | | | | | | | | | | | | | | |
| <\$25,000 | 2702 | 37.3 | 34.5 | 40.2 | 23.5 | 21.1 | 26.0 | 17.3 | 15.1 | 19.8 | 24.4 | 21.9 | 27.2 | 12.5 | 10.4 | 14.9 | 38.8 | 35.9 | 41.7 | 34.5 | 31.7 | 37.5 | 22.7 | 20.3 | 25.4 |
| \$25,000 or more | 5598 | 28.3 | 26.5 | 30.1 | 14.4 | 13.0 | 15.8 | 9.9 | 8.9 | 11.1 | 16.5 | 15.1 | 18.0 | 4.4 | 3.6 | 5.4 | 28.5 | 26.7 | 30.4 | 23.5 | 21.8 | 25.3 | 14.2 | 12.8 | 15.7 |
| Race/Ethnicity: | | | | | | | | | | | | | | | | | | | | | | | | | |
| White, non-Hispanic | 9037 | 29.9 | 28.4 | 31.5 | 15.9 | 14.8 | 17.2 | 11.7 | 10.7 | 12.9 | 18.3 | 17.0 | 19.7 | 6.1 | 5.3 | 7.1 | 29.5 | 28.0 | 31.0 | 25.8 | 24.3 | 27.3 | 15.2 | 14.0 | 16.4 |
| AI/AN* | 639 | 40.4 | 33.7 | 47.5 | 29.3 | 23.1 | 36.2 | 18.4 | 13.3 | 24.9 | 25.1 | 19.1 | 32.3 | 22.5 | 16.6 | 19.8 | 52.2 | 45.3 | 59.0 | 47.5 | 40.7 | 54.5 | 36.6 | 30.1 | 43.6 |
| Other or Hispanic** | 530 | 42.2 | 34.6 | 50.3 | 30.8 | 24.0 | 38.5 | 18.6 | 13.3 | 25.3 | 28.1 | 21.3 | 36.0 | 18.5 | 12.6 | 26.4 | 48.6 | 40.8 | 56.5 | 40.9 | 33.4 | 48.9 | 29.2 | 22.3 | 37.2 |
| Disability: | | | | | | | | | | | | | | | | | | | | | | | | | |
| No Disability | 2978 | 38.6 | 35.9 | 41.4 | 25.6 | 23.2 | 28.1 | 20.1 | 17.7 | 22.6 | 25.9 | 23.4 | 28.5 | 9.8 | 7.9 | 12.2 | 39.2 | 36.5 | 42.0 | 29.5 | 26.9 | 32.4 | 23.6 | 21.2 | 26.1 |
| Disability | 6158 | 28.1 | 26.4 | 29.9 | 14.1 | 12.8 | 15.5 | 9.5 | 8.4 | 10.7 | 16.4 | 15.0 | 17.9 | 6.6 | 5.6 | 7.7 | 28.6 | 26.9 | 30.4 | 27.0 | 25.2 | 28.8 | 14.2 | 12.9 | 15.7 |

§ See the methods section Sidebar for the exact questions corresponding to reference numbers 1-8 for each ACE category above

* Number of respondents varies slightly due to occasional "don't know, not sure" and missing responses.

* American Indian or Alaska Native only.

**All other non-White (including multiracial) or Hispanic

Estimated Prevalence of ACE Scores in Montana

Forty percent of Montana adults had ACE scores of zero, 43% reported experiencing between one and three ACEs, and 17% reported experiencing four or more ACEs before they turned 18 (Figure 1). ACE scores were similar for men and women (Table 2). A higher percent of American Indian/Alaska Natives than White non-Hispanic adults reported experiencing four or more ACEs, as did adults who had not completed high school compared to those who had more education, adults with lower annual incomes compared to those with higher incomes, and adults with disabilities compared to those without disabilities. Fewer adults ages 55 years and older reported experiencing four or more ACEs than younger adults.

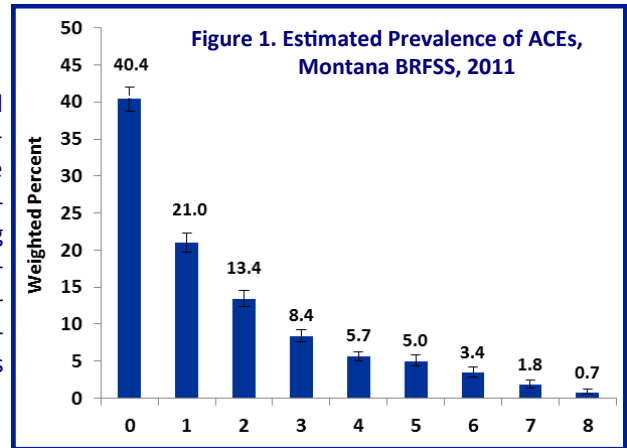


Table 2. Prevalence of ACE Scores (ACEs)[§] by Sociodemographic Characteristics, Montana BRFSS, 2011

| | Number of Respondents ¹ | 0 ACEs | | | 1 to 3 ACEs | | | 4 or more ACEs | | |
|------------------------|------------------------------------|-------------|-----------|-----------|-------------|-----------|-----------|----------------|-----------|-----------|
| | | Wt. % | 95% CI LL | 95% CI UL | Wt. % | 95% CI LL | 95% CI UL | Wt. % | 95% CI LL | 95% CI UL |
| All Adults: | 8,765 | 40.4 | 38.8 | 42.0 | 42.8 | 41.2 | 44.4 | 16.8 | 15.5 | 18.1 |
| Sex: | | | | | | | | | | |
| Male | 3,733 | 41.2 | 38.9 | 43.6 | 43.2 | 19.1 | 22.9 | 15.6 | 13.8 | 17.7 |
| Female | 5,032 | 39.6 | 37.6 | 41.7 | 42.5 | 40.4 | 44.7 | 17.9 | 16.2 | 19.7 |
| Age: | | | | | | | | | | |
| 18 - 34 | 1,243 | 33.7 | 30.3 | 37.2 | 43.5 | 40.0 | 47.1 | 22.8 | 19.8 | 26.1 |
| 35 - 54 | 2,518 | 34.7 | 32.0 | 37.5 | 47.1 | 44.2 | 49.9 | 18.2 | 16.0 | 19.7 |
| 55 and older | 4,968 | 50.2 | 48.2 | 52.3 | 38.6 | 36.6 | 40.7 | 11.1 | 9.9 | 12.5 |
| Race/Ethnicity: | | | | | | | | | | |
| White, non-Hispanic | 7,820 | 42.3 | 40.7 | 44.0 | 42.7 | 41.1 | 44.4 | 15.0 | 13.7 | 16.3 |
| AI/AN* | 497 | 21.4 | 16.2 | 27.6 | 44.2 | 37.4 | 51.2 | 34.4 | 27.5 | 42.0 |
| Other or Hispanic** | 414 | 25.1 | 18.8 | 32.6 | 43.5 | 35.5 | 51.8 | 31.4 | 23.9 | 40.0 |
| Education: | | | | | | | | | | |
| <High School | 586 | 28.0 | 23.1 | 33.6 | 39.6 | 33.7 | 45.8 | 32.4 | 26.6 | 38.8 |
| High School | 2,748 | 38.1 | 35.3 | 42.7 | 45.0 | 42.1 | 47.9 | 16.9 | 14.6 | 19.4 |
| >High School | 5,420 | 43.4 | 41.4 | 45.4 | 42.3 | 40.3 | 44.3 | 14.3 | 12.9 | 15.9 |
| Income: | | | | | | | | | | |
| <\$25,000 | 2,553 | 33.3 | 30.6 | 36.2 | 41.6 | 38.6 | 44.6 | 25.1 | 22.4 | 28.0 |
| ≥\$25,000 | 5,411 | 43.2 | 41.2 | 45.2 | 44.5 | 42.5 | 46.5 | 12.3 | 11.0 | 13.7 |
| Disability: | | | | | | | | | | |
| No | 5,916 | 43.7 | 41.8 | 45.7 | 42.7 | 40.8 | 44.7 | 13.5 | 12.1 | 15.1 |
| Yes | 2,809 | 32.0 | 29.5 | 34.6 | 43.0 | 40.2 | 45.8 | 25.0 | 22.4 | 27.8 |

[§] ACE Score range from 0-8 based on the five calculated household dysfunction variables and three calculated abuse variables.

¹ Number of respondents varies slightly due to occasional "Don't know/Not sure" and missing responses.

* American Indian or Alaska Native only.

**All other non-White (including multiracial) or Hispanic

Association of ACE Scores with Health Status, Risk Factors, and Diagnosed Chronic Diseases

Adults with ACE scores of 4 or more reported poor physical or mental health more often than those with no ACEs (Table 3). They also reported smoking, drinking, or misuse of prescription drugs, and being obese or having high cholesterol more often (Table 4). These outcomes also varied by sex, age group, race, and educational attainment (data not shown), as did ACE scores.

The relationships among ACE scores, demographic characteristics, and health outcomes are complex. Multiple logistic regression analysis can isolate the relationship between ACE scores and health outcomes, holding the effects of the demographic factors constant. The relationships are expressed as adjusted Odds Ratios (aORs). aORs greater than 1.00, with a 95% Confidence Interval (CI) that does not include 1.00, indicate that ACE scores have statistically significant independent associations with risky behaviors or poor health outcomes, after taking into account the effects of other factors known to be related to both ACE scores and outcomes.

For example, in Table 3, 3.19 times more adults who reported 4 or more ACEs classified their general health as only Fair or Poor, compared to those who reported no ACEs (the reference category). The associations between ACE scores and poor mental health were especially strong. More than six times as many adults with ACE scores of 4 or more reported experiencing poor mental health on 14 or more days in the month before the interview as those with no ACEs, and they reported having a doctor-diagnosed depressive disorder more than six times more frequently.

Table 4. Prevalence of Health Risk Behaviors and Physical Health Risks by ACE Score, Montana Adults, BRFSS 2011§

| | Number Resp.* | 95% CI | | | Adj. Odds Ratio | 95% CI | |
|---|------------------|----------|------|------|-----------------------|----------|-------|
| | | Wt. % | LL | UL | | LL | UL |
| Current Cigarette Smoker | | | | | | | |
| 0 ACEs | 3,821 | 11.7 | 10.2 | 13.4 | 1.00 | Referent | |
| 1 to 3 ACEs | 3,679 | 22.0 | 19.9 | 24.1 | 1.92 | 1.56 | 2.35 |
| 4 or more ACEs | 1,235 | 41.6 | 37.3 | 46.0 | 4.17 | 3.23 | 5.38 |
| Heavy Alcohol Use [†] | | | | | | | |
| 0 ACEs | 3,798 | 5.5 | 4.5 | 6.7 | 1.00 | Referent | |
| 1 to 3 ACEs | 3,655 | 8.0 | 6.8 | 9.3 | 1.42 | 1.08 | 1.86 |
| 4 or more ACEs | 1,223 | 9.6 | 7.2 | 12.6 | 2.11 | 1.47 | 3.01 |
| Misuse of Prescription Pain Medications | | | | | | | |
| 0 ACEs | 3,815 | 1.4 | 0.9 | 2.1 | 1.00 | Referent | |
| 1 to 3 ACEs | 3,679 | 4.1 | 3.2 | 5.1 | 2.76 | 1.62 | 4.70 |
| 4 or more ACEs | 1,232 | 9.6 | 7.2 | 12.6 | 6.25 | 3.49 | 11.20 |
| Obesity | | | | | | | |
| 0 ACEs | 3,698 | 22.8 | 20.7 | 25.0 | 1.00 | Referent | |
| 1 to 3 ACEs | 3,582 | 25.1 | 23.0 | 26.4 | 1.16 | 0.97 | 1.37 |
| 4 or more ACEs | 1,202 | 30.2 | 26.4 | 34.3 | 1.50 | 1.17 | 1.86 |
| High Cholesterol | | | | | | | |
| 0 ACEs | 3,269 | 33.3 | 31.0 | 35.6 | 1.00 | Referent | |
| 1 to 3 ACEs | 3,029 | 34.1 | 31.7 | 36.5 | 1.31 | 1.12 | 1.54 |
| 4 or more ACEs | 969 | 37.6 | 33.0 | 42.5 | 1.84 | 1.45 | 2.33 |
| High Blood Pressure | | | | | | | |
| 0 ACEs | 3,824 | 31.8 | 29.7 | 34.0 | 1.00 | Referent | |
| 1 to 3 ACEs | 3,685 | 27.0 | 25.0 | 29.0 | 0.97 | 0.83 | 1.13 |
| 4 or more ACEs | 1,233 | 34.2 | 30.2 | 38.5 | 1.75 | 1.38 | 2.22 |
| * Number of respondents varies slightly due to occasional “DK/NS” and missing responses. | | | | | | | |
| † Odds Ratios adjusted for the effects of age, sex, race, and educational levels. | | | | | | | |
| Bolded Odds Ratio indicate adults with this ACE score have a statistically significantly elevated estimated prevalence of risk the risk factor or behavior, controlling for age, | | | | | | | |
| [‡] Heavy Alcohol Use is defined as consumption of more than two alcoholic drinks per day for men and more than one alcoholic drink per day for women. | | | | | | | |

Table 3. Prevalence of Selected Health Status Indicators by ACE Score, Montana Adults, 2011

| | Number | 95% CI | | | Adj. | 95% CI | |
|----------------------------------|--------|--------|------|------|-------------------------|----------|------|
| | Resp.* | Wt. % | LL | UL | Odds Ratio [†] | LL | UL |
| Fair or Poor General Health | | | | | | | |
| 0 ACEs | 3,820 | 12.9 | 11.3 | 14.6 | 1.00 | Referent | |
| 1 to 3 ACEs | 3684 | 15.8 | 14.1 | 17.6 | 1.48 | 1.19 | 1.84 |
| 4 or more ACEs | 1234 | 27.5 | 23.7 | 31.6 | 3.19 | 2.42 | 4.22 |
| 14+ Days of Poor Physical Health | | | | | | | |
| 0 ACEs | 3,750 | 9.0 | 7.8 | 10.4 | 1.00 | Referent | |
| 1 to 3 ACEs | 3640 | 11.9 | 10.4 | 13.6 | 1.55 | 1.24 | 1.92 |
| 4 or more ACEs | 1221 | 21.3 | 18.0 | 25.0 | 3.19 | 2.43 | 4.20 |
| 14+ Days of Poor Mental Health | | | | | | | |
| 0 ACEs | 3773 | 4.4 | 3.6 | 5.3 | 1.00 | Referent | |
| 1 to 3 ACEs | 3639 | 11.5 | 10.0 | 13.1 | 2.85 | 2.22 | 3.67 |
| 4 or more ACEs | 1218 | 23.2 | 19.8 | 27.1 | 6.21 | 4.64 | 8.30 |
| 14+ Days of Activity Limitation | | | | | | | |
| 0 ACEs | 1,585 | 11.8 | 9.6 | 14.5 | 1.00 | Referent | |
| 1 to 3 ACEs | 2,040 | 12.5 | 10.6 | 14.6 | 1.26 | 0.92 | 1.74 |
| 4 or more ACEs | 892 | 24.1 | 19.9 | 28.9 | 3.32 | 2.27 | 4.85 |
| Doctor Diag. Depressive Disorder | | | | | | | |
| 0 ACEs | 3,824 | 10.3 | 8.9 | 11.9 | 1.00 | Referent | |
| 1 to 3 ACEs | 3679 | 22.2 | 20.2 | 24.3 | 2.50 | 2.01 | 3.03 |
| 4 or more ACEs | 1233 | 42.2 | 37.9 | 46.5 | 6.13 | 4.78 | 7.85 |

* Number of respondents varies slightly due to occasional "DK/NS" and missing responses.

† Odds Ratios adjusted for the effects of age, sex, race, and educational levels.

Bolded Odds Ratio indicate adults with this ACE score are significantly related with the health status even after controlling for age, sex, race, and educational levels.

The aORs for smoking, heavy alcohol use, and misuse of prescription pain medications were significantly greater than 1.00 among adults with ACE scores of 1 to 3 and 4 or more.

Because smoking, heavy alcohol consumption, obesity, high cholesterol, and high blood pressure varied by ACE score categories, and because these factors are themselves risks for chronic diseases, we constructed a second multiple logistic regression model controlling for demographic factors plus these risk factors (Model 2, Table 5). The aORs in Model 2 were generally similar to the aORs for Model 1, although the aORs in Model 2 were lower for most chronic diseases. This suggests that ACE scores may measure something that acts as an additional risk factor for chronic disease prevalence, even after taking into account the intervening effects of demographic characteristics and behavioral and physiologic risk factors.

As the number of adverse childhood experiences (ACEs) increased, reported overall health and mental health declined.

Table 5. Prevalence of Selected Chronic Health Conditions by ACE Score, Montana BRFSS, 2011

| | Number Resp.* | Prevalence | | | Adjusted Model 1† | | | Adjusted Model 2‡ | | |
|--|----------------------|------------|------|------|-------------------|----------|------|-------------------|----------|------|
| | | 95% CI | | | Adj. 95% CI | | | Adj. 95% CI | | |
| | | Wt. % | LL | UL | Odds Ratio† | LL | UL | Odds Ra- | LL | UL |
| Arthritis | | | | | | | | | | |
| 0 ACEs | 3,806 | 23.9 | 22.1 | 25.8 | 1.00 | Referent | | 1.00 | Referent | |
| 1 to 3 ACEs | 3,671 | 25.1 | 23.1 | 27.1 | 1.44 | 1.23 | 1.71 | 1.31 | 1.10 | 1.56 |
| 4 or more ACES | 1,229 | 35.3 | 31.4 | 39.4 | 3.18 | 2.52 | 4.02 | 2.57 | 1.98 | 3.34 |
| Current Asthma | | | | | | | | | | |
| 0 ACEs | 3,813 | 6.3 | 5.3 | 7.6 | 1.00 | Referent | | 1.00 | Referent | |
| 1 to 3 ACEs | 3,667 | 8.9 | 7.6 | 10.4 | 1.42 | 1.16 | 1.73 | 1.42 | 1.08 | 1.88 |
| 4 or more ACES | 1,227 | 15.5 | 12.4 | 18.9 | 2.31 | 1.66 | 3.22 | 1.98 | 1.38 | 2.85 |
| Any Cardiovascular Disease§ | | | | | | | | | | |
| 0 ACEs | 3,790 | 8.7 | 7.5 | 10.0 | 1.00 | Referent | | 1.00 | Referent | |
| 1 to 3 ACEs | 3,668 | 6.9 | 5.9 | 8.0 | 1.04 | 0.82 | 1.32 | 0.89 | 0.69 | 1.16 |
| 4 or more ACES | 1,222 | 11.1 | 8.6 | 14.3 | 2.42 | 1.74 | 3.38 | 1.74 | 1.18 | 2.58 |
| Chronic Obstructive Pulmonary Disease (COPD) | | | | | | | | | | |
| 0 ACEs | 3,815 | 4.2 | 3.4 | 5.2 | 1.00 | Referent | | 1.00 | Referent | |
| 1 to 3 ACEs | 3,670 | 5.4 | 4.5 | 6.5 | 1.56 | 1.16 | 2.09 | 1.33 | 0.97 | 1.83 |
| 4 or more ACES | 1,229 | 12.4 | 9.7 | 15.6 | 4.10 | 2.90 | 5.80 | 2.29 | 1.51 | 3.46 |
| Diabetes | | | | | | | | | | |
| 0 ACEs | 3,831 | 7.6 | 6.6 | 8.8 | 1.00 | Referent | | 1.00 | Referent | |
| 1 to 3 ACEs | 3,685 | 7.7 | 6.6 | 9.0 | 1.35 | 1.07 | 1.70 | 1.31 | 1.01 | 1.70 |
| 4 or more ACES | 1,238 | 9.7 | 7.4 | 12.7 | 2.17 | 1.56 | 3.02 | 1.59 | 1.13 | 2.25 |

* Number of respondents varies slightly due to occasional missing responses.

† Odds Ratios adjusted for the effects of age, sex, race, and educational levels.

‡ Odds Ratio adjusted for the effects of age, sex, race, education, smoking, heavy alcohol consumption, obesity, high cholesterol, and high blood pressure.

Bolded Odds Ratio indicate adults with this ACE score are significantly related with the chronic health condition even after controls instituted.

§ Respondent reported being diagnosed with at least one of the following conditions: heart attack/myocardial infarction, angina/coronary heart disease, or stroke.

CONCLUSION

Approximately 60% of Montana adults reported experiencing at least one ACE, and nearly a third reported experiencing more than one. ACE scores were higher among American Indian than White adults and higher among adults with less education, lower incomes, and among those with self-reported disabilities. High ACE scores were associated with increased prevalence of poor self-reported physical and mental health, health risk behaviors, and diagnosed chronic disease.

Montana's results were similar to those reported by several other states that included the ACE module in their BRFSS surveys in many respects. Across the studies, 55% to 65% of adults reported at least one ACE, and more than a third reported two or more. The surveys are consistent in finding associations between high ACE scores and negative behavioral and health outcomes, in spite of disparate samples and different analytic approaches.

The consistency of the associations reported between high ACE score categories and poorer behavioral and health outcomes suggests that childhood maltreatment has lifelong ill-effects for a substantial proportion of the general population. Strategies to prevent adverse childhood experiences and provide resources for adults who experienced them may help improve the public's health.

Background: The Montana Behavioral Risk Factor Surveillance System (BRFSS) has been collecting and reporting state-specific, population-based estimates of health-related data since 1984. The purpose of this statewide telephone survey of Montana residents aged 18 and older is to gather information regarding personal health risk behaviors, selected medical conditions, and the prevalence of preventive health care practices among Montana adults. A full set of Montana yearly questionnaires and health indicators can be found on the Department of Public Health and Human Services (DPHHS) BRFSS database query system website at www.brfss.mt.gov. The CDC website also provides national, state, and some local area prevalence estimates of health indicators, as well as access to downloadable datasets for further analyses at: www.cdc.gov/brfss.

Survey Limitations: The BRFSS relies on self-reported data. This type of survey has certain limitations: many times, respondents have the tendency to underreport some behaviors that may be considered socially unacceptable (e.g., smoking, heavy alcohol use); conversely, respondents may over report behaviors that are desirable (e.g., physical activity, nutrition). Cross-sectional design makes causal conclusions impossible. In addition, the sample sizes used to calculate the estimates in this report vary as respondents who indicated, "don't know," "not sure," or "refused" were excluded from most of the calculation of prevalence estimates. BRFSS data collected through 2008 excludes households without landline telephones.

Acknowledgements: The Montana BRFSS Office staff gratefully acknowledges the efforts of the Montana residents who took the time to respond to the telephone interviews conducted for this system. The Montana BRFSS is conducted through a Cooperative Agreement between the Centers

for Disease Control and Prevention and the Montana Department of Public Health and Human Services. This publication was supported by CDC Cooperative Agreement #5O11-110101CONT11. Alternative formats of this document will be provided upon request. Please contact Dr. Joanne Oreskovich, MT BRFSS Director (444-2973). The contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC.

Suggested citation: Oreskovich J. Ballew C. The Prevalence of Adverse Childhood Experiences (ACEs) and their Association with Current Health, Montana Behavioral Risk Factor Surveillance System (BRFSS), 2011. *Montana Fact[or]s*, No.1: 2013, DPHHS: Helena, MT

References:

- ¹Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The adverse childhood experiences (ACE) study. *Am J Prev Med* 1998; 14:245-58.
- ²Anda RF, Felitti VJ, Bremner JD, Walker JD, Whitfield C, Perry BD, Dube SR, & Giles WH. The enduring effects of abuse and related adverse experiences in childhood. *European Archives of Psychiatry and Clinical Neuroscience*, 2006;256.
- ³Felitti VJ The relation between adverse childhood experiences and adult health: Turning Gold into Lead, *The Permanente Journal*, 2002: 6, 1: 44-47.
- ⁴ACE Team, Division of Adult and Community Health, NCCDPHP and Division of Violence Prevention, NCIPC. *Proposal for Adverse Childhood Experiences Questions for the 'Optional Module' of the BRFSS Questionnaire*. CDC, Atlanta, GA. May 31, 2006.
- ⁵Bynum L, Griffin T, Ridings DL, et al. Adverse Childhood Experiences Reported by Adults - Five States, 2009. *MMWR* 2010; 59:1609-1613.
- ⁶BRFSS surveys that have included the module are: Arkansas (2009), District of Columbia (2010), Hawaii (2010), Louisiana (2009), Maine (2010) Minnesota (2011), Montana (2011), Nebraska (2010), Nevada (2010), New Mexico (2009), Ohio (2010), Pennsylvania (2010), Tennessee (2009), Utah (2010), Vermont (2010, 2011), Washington (2009, 2010), Wisconsin (2010, 2011) based on www.cdc.gov/brfss and personal correspondence with Dr. Leah Gilbert, EIS Officer, Office of Surveillance, Epidemiology, and Laboratory Services, CDC, April 3, 2013.
- ⁶See *BRFSS Operational and Users' Guide* at <http://www.cdc.gov/brfss/>.
- ⁷See Montana BRFSS website at www.brfss.mt.gov/.

